Introduction to Veterinary and Comparative Forensic Medicine

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Introduction to Veterinary and Comparative Forensic Medicine
Reading maketh a full man; conference a ready man and writing an exact man.

Francis Bacon

The design of a book is the pattern of a reality controlled and shaped by the mind of the writer. This is completely understood about poetry or fiction, but it is too seldom realised about books of fact.

John Steinbeck

Writing a book is an adventure. To begin with, it is a toy and an amusement; then it becomes a mistress, and then it becomes a master, and then a tyrant. The last phase is that just as you are about to be reconciled to your servitude, you kill the monster and fling him out to the public.

Winston Churchill
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Dedication

To the memory of Francis and Elizabeth Vowles, for their encouragement and guidance and in recognition of their shared concern for social justice

and

To Eric and Dorothy Cooper, for their interest in our joint work and their unchanging welcome, succour and support

and

To Moses Cooper, born 10 February 2006, when this book was drawing to its conclusion and who represents the future
Foreword

There can be no doubt that forensic medicine – whether applied to humans alone or to all animals – is becoming increasingly important in this modern, litigious world. The medical/legal interface, both civil or criminal, is becoming increasingly challenging and it is essential that there are practitioners available to the courts who have both the requisite knowledge and experience to perform the examinations in a satisfactory manner and who can also provide evidence to enable the court to reach its verdict.

The application of forensic techniques to the understanding and solving of crimes has been well established for a century or more. Despite this longevity, forensic medicine still continues to develop new specialist areas in response to pressure from the police and the criminal justice system. The speciality of veterinary forensic medicine is now an established, but infant, specialist area. It has been clear for some time that it is essential that it should be provided with a clear, accurate and accepted academic footing on which to develop. This book provides such a footing.

This textbook emphasises the need for a methodical, careful and precise approach to all problems. It accepts that not all practitioners will have all of the precise skills that may eventually be needed in any particular case and it emphasises that the adoption of the correct approach that will allow others – possibly someone with greater specialist skills or maybe simply an expert acting for the defence – to understand and to trust the process by which the information was obtained so that they may form their opinions based on reliable evidence.

Just as forensic medicine covers many disparate areas so too does forensic veterinary practice and all of the relevant subjects from animal welfare to biodiversity and international regulations are carefully and comprehensively considered in this book. The extent and the variation of legislation around the world means that no one book can deal with all legal aspects, and this book relates in the main to the law as currently enacted to England and Wales, but it also deals with the increasingly important, and voluminous, European legislation and with the important international treaties.

The authors have ensured that the book is specifically designed to be practical and they have included useful, focused and reliable advice on the handling of case-work throughout the text. The case histories that are included provide a superb basis for learning and for the understanding of both basic and more advanced forensic concepts. However, the practice of forensic medicine does not stop at the examination of a scene or the examination of the victim or perpetrator and this book recognises these crucial aspects and also deals with report writing and the giving of evidence in court.

This excellent book is entitled Introduction to Veterinary and Comparative Forensic Medicine, but it is far more than just an ‘Introduction’. It is a thorough and complete overview of this developing speciality and provides both practitioners already working within this field and those seeking to develop a specialist interest and skill in veterinary forensic medicine with a reliable and comprehensive textbook.
Those who choose to practise Veterinary Forensic Medicine must now move their subject forward. They must ensure that current and future practitioners are both skilled and experienced in all the relevant areas of practice. They must insist on the development of professional bodies and they must ensure that the police, the courts and the public insist on that professionalism and expertise.

John and Margaret Cooper have worked tirelessly for veterinary medicine around the world. To bring to one book such experience and expertise is rare and their joint efforts in writing this book reflect their immense knowledge and enthusiasm for their subject.

Richard Shepherd, BSc, MB BS, FRCPath, DMJ
Senior Lecturer and Head of Department
Forensic Medicine Unit, St. George’s Medical School, London
Past-President
Section of Clinical Forensic & Legal Medicine
The Royal Society of Medicine, London
Authors’ Preface

Democracy and human rights are inseparable.

Nelson Mandela

When we first proposed writing a book on forensic medicine, we did so because of our awareness of the necessity for members of the veterinary profession to have readily available information concerning the principles and practice of forensic science and its applicability to work with animals. Below we describe that need, which is now stronger than ever, and then analyse it in more detail in the introductory chapters.

Over the past two years, however, our rationale for producing this book has extended and we believe that the demand for such a text is even more pressing. This is because the term ‘forensic’ is increasingly being employed in a broader sense than its original meaning of ‘relating to the law’. People from diverse scientific backgrounds are regularly referring to the use of ‘forensic’ methods in their work. For example, the designation is often made use of by those investigating environmental changes, such as oil spills or damage to or destruction of coral reefs. In a similar vein, archaeologists, palaeontologists and historians talk of employing a ‘forensic’ approach to their excavations or literature searches.

‘Forensic’ here implies a detailed investigation and collection of evidence, regardless of whether or not there is a specific legal case or enquiry pending. Those involved are effectively applying forensic method, with all its meticulousness and need for proper record-keeping, to their routine activities. In short, the detective work that has always been the hallmark of the forensic scientist is now being applied to a whole spectrum of scientific endeavour, much of which relates to animals, plants or the environment. The pressure for this has come from many quarters, not least the increasing need nowadays to be able to defend one’s opinions, judgements and statements if challenged at a later stage. Here the ‘forensic’ approach offers an ideal paradigm.

In view of these trends, we decided to broaden the scope of this book so as to provide the reader with an introduction to techniques and methods of working that are not only essential when dealing with animals or their derivatives when part of a legal action but which are also ‘good practice’ in other fields. In so doing, we hope that the book will prove helpful to those in various disciplines, as well as veterinarians, biologists and others who are concerned with captive or free-living animals.

Nevertheless, the main thrust of this volume remains how best to provide sound, reliable and objective evidence for court cases or other legally-based hearings that concern animals or their products. There has been an unprecedented increase in litigation relating to animals over the past few years. Typical cases concern such issues as provenance, age-determination and parentage, causes of death, and health and welfare. Forensic evidence is also often an important component of insurance claims and allegations of professional misconduct.

Forensic veterinary medicine is part of the broader field of comparative forensic medicine (see Chapter
2), a rapidly developing discipline that increasingly involves those who are concerned with captive and free-living animals. New fields of activity are emerging – for example, on account of concern about global pollution, the decline in biodiversity and public demands that action should be taken over illegal and irresponsible damage to the planet.

Another area in which the need for sound forensic evidence from veterinary surgeons (veterinarians) and others is expanding concerns the links between animal abuse, maltreatment of children and domestic violence. It is here that veterinary forensic medicine extends into and overlaps with forensic paediatrics, psychology and sociology. A key need is the recognition by veterinary clinicians of ‘non-accidental injuries’ in animals, but the issue has far wider implications than this because it requires close contact with other groups, including medical and dental practitioners, social workers, teachers and police officers.

Although forensic medicine as it relates to animals has a ubiquitous role and offers exciting challenges, it is as yet not a bona fide subject within the veterinary curriculum and is given little or no recognition as a post-graduate specialism. This lack of status, coupled with a paucity and scattering of literature and data, has tended to hamper the ability of veterinarians to contribute their skills and knowledge. A similar situation applies to other groups who work with animals, where involvement in legal cases is often only a relatively small part of their work and the attaining of forensic expertise is not afforded appropriate attention.

It is clearly important that veterinarians and others who work with animals are aware of the potential of litigation and that they orientate their day-to-day activities accordingly. Increased pressure must be put on professional and regulatory authorities to recognise veterinary and comparative forensic medicine as disciplines in their own right and to provide adequate funding and support for their development.

This book is not meant to be either a veterinary or a legal textbook. It is intended to reflect the interdisciplinary nature of modern forensic medicine and the need for mutual understanding between lawyers and those involved with animals, especially veterinarians. However, some medical or legal subjects are discussed in detail because of their particular importance in ‘animal forensics’ and the pressure nowadays on lawyers to know more about the medical aspects and on those from a veterinary or biological background to understand better the legal process. In that context, two books published by the Royal Society of Medicine, *Law for Doctors* (Branthwaite and Beresford, 2003) and *Medicine for Lawyers* (Palmer and Wetherill, 2004) are to be welcomed.

We have tried to provide a comprehensive index and we have therein included some American spellings, where appropriate, to help colleagues from that side of the Atlantic to locate information immediately. If the reader does not find what s/he wants in the text – or it is judged insufficient – there are likely to be relevant references listed at the end of the book.

Our main objective in writing this book has been to provide a ready guide to the principles of forensic medicine for veterinarians and others who are involved with animals. In compiling the text we have sought to combine our experience and training as a husband/wife, veterinary pathologist/lawyer. We have travelled widely and have dealt with a broad range of animal species, under diverse circumstances. In view of our experiences living overseas, we have tried in these pages to reach out to poorer parts of the world, especially ‘developing’ countries (152 were listed by the World Bank in 2005) where facilities for forensic work – and the expertise to go with it – are often in very short supply.

The art and science of forensic medicine have largely emanated from the richer, ‘developed’, countries and, as a result, many of the techniques now advocated and the precision that is demanded, while relevant to well-organised modern societies, can be totally inappropriate in poorer parts of the world. Therefore, in the text we have endeavoured to cater for the needs of the latter by drawing attention to ways in which the standards of forensic medicine can be maintained or enhanced despite the absence of strong or reliable infrastructure. Good forensic medicine *can* be practised in these places but ingenuity is often required, coupled where appropriate with help from outside.

Our hope is that our book will help those involved in legal and other actions concerning animals to
gain access to sound evidence that is both based on good science and obtained using best available practice.

We are of the generation born during the Second World War. Our future – and that of our children – was to be enshrined in the Preamble to the Charter of the United Nations (UN), which came into force on 24th October, 1945:

*We the peoples of the United Nations,*
determined to save succeeding generations from the scourge of war, which twice in our lifetime has brought untold sorrow to mankind . . .

*reaffirm faith in fundamental human rights, in the dignity and worth of the human person, in the equal rights of men and women and of nations large and small . . .

Alas, many of the bold statements made in that Charter have failed to prevent further conflict, genocide, oppression and diverse assaults on human rights. At the time of our writing (2006), real and perceived threats of terrorism have prompted governments to introduce measures that are not only contrary to the UN Charter but incompatible with earlier, sometimes ancient, declarations and agreements relating to the freedom of the individual. An independent judiciary, open courts, access to lawyers and verdicts based on sound evidence are all part of ensuring that human rights are not eroded. Raising the standards of forensic medicine as it relates to animals is but a tiny part of that mosaic but it represents our modest contribution. The reader should be aware, therefore, that our book is not intended to help secure punishment for those who transgress laws and codes relating to animals; nor in what we write do we seek to excuse or exonerate those who are, indeed, guilty of crimes or malpractice. Instead, we wish to ensure that, as far as is humanly possible, courts, tribunals, disciplinary hearings and the like are provided with sound evidence as a basis for deliberation.

*John E. Cooper  Margaret E. Cooper*

*St. Augustine, Trinidad & Tobago, West Indies, January 2006*
Acknowledgements

First, we should like to express our gratitude to our friend, Dr. Richard Shepherd, an experienced and highly respected forensic pathologist who has a great interest in veterinary and comparative medicine, for agreeing to write the Foreword to this book and for his enthusiastic and good-humoured encouragement in this and other forensic ventures.

Over the years, many people have catalysed our shared interest in veterinary medicine and the law and the relevance of these two disciplines to the conservation and protection of the natural world. Our early participation in forensic matters was stimulated by Alastair Porter, Registrar of the Royal College of Veterinary Surgeons (RCVS) 1966–1991, Peter Robinson and Michael Chapman. Numerous other veterinary surgeons, biologists, field naturalists and lawyers were involved in those studies or gave us help. Some are mentioned individually, later in these Acknowledgements, or elsewhere in the text. We remember here our friend, Joan Root, naturalist and film-maker, who devoted much of her life to the protection of the wildlife of Kenya and news of whose death reached us as we were completing this part of our book. Kwa heri, Joan, na Mungu akuihariki.

JEC owes a great deal to numerous mentors: the training and guidance he received in natural history from Major Maxwell Knight (former MI5 agent, the prototype for ‘M’ in the James Bond books) and Mr. Gerald Durrell (animal collector extraordinaire and Founder of the Jersey Zoo), in osteology and primatology from Dr. Louis S.B. Leakey and Professor Philip V. Tobias (the internationally recognised Kenyan and South African palaeontologists) and in diagnostic pathology of creatures both great and small from Professor Peer Zwart and Dr. Edward Elkan (arguably ‘the father of lower vertebrate pathology’).

Our families have always given us support and encouragement. We thank our daughter, Vanessa, and our son, Maxwell, for their interest in all we do and to them both and to Sarah (Hutton) Cooper for commenting on earlier drafts. Part of the text was also reviewed by Diana (Cooper) Dymond. Our parents, to whom we owe so much, are the subject of the Dedication at the beginning of the book.

Writing an interdisciplinary text is never easy and we are therefore indebted to the many people who have assisted us in disparate ways. A number of colleagues and friends have reviewed sections of chapters and appendices or have made helpful comments and criticisms about the book. In this respect we are most grateful to Andrew Adogwa, Sham Bissessar, Gustave Borde, Dane Coombs, Adrian Hailey, Annemarie Phillip-Hosein, Adana Mahase, Howard and Eleanor Nelson, Kristel-Marie Ramnath, Rohini Roopnarine, Ravi Seedaransingh, Verrol Simmons, Rod Suepaul and Cheryl-Ann Wharewood in Trinidad; Donald Broom, Phil Cannings, Simon Chaplin, Martyn Cooke, Neil Forbes, Neville

Nothing in nature stands alone.

John Hunter
Acknowledgements

Gregory, Andrew Greenwood, Mike Hart, Mike Jessop, Martin Lawton, Chris Laurence, Ian McDowall, Fred McKeating, Peter Scott, Holger Schutkowski, Guy Shorrock, Jill Webb and Sean Wensley in the United Kingdom; David Bayvel, Richard Norman and Virginia Williams in New Zealand; Richard Wootton in Australia; Jesús Pérez Jiménez in Spain; Andy Allen and Sharon E. Cregier in Canada; Peter Dawson and Fritz Huchzermeyer in South Africa; Jack Reece in India; and Phil Arkow, Nélio Barros, Michael Fox, Fred Frye and Janet Whaley in the USA. David Watson came to the University of the West Indies from Australia as a volunteer teacher in small animal medicine, not realising that his skills as an editor would be put to immediate good use by the Coopers. We are indebted to him. Madeleine Forsyth, with her combined veterinary and legal qualifications, kindly provided advice at the interface of these disciplines.

Specific guidance on certain aspects was provided by two friends and colleagues, Dr. Steve Bennett, doyen of the veterinary profession in Trinidad and Tobago, and Professor Ram Prabhu. Mr. Emmanuel Walker arranged for us to visit the Forensic Science Laboratory, Port of Spain. The Veterinary Defence Society constructively reviewed certain sections. Mr. Alan Kershaw, Director of the Council for the Registration of Forensic Practitioners (CRFP) advised and gave permission for us to reproduce the CRFP Code of Practice and Mr. Gordon Hockey did likewise in respect of the Guide to Professional Conduct of the RCVS. The Universities Federation for Animal Welfare, through its Chief Executive and Scientific Director, Dr James Kirkwood, authorised the use of the passage from Animals and the Law by T. G. Field-Fisher. Chief Superintendent Phil Wilson of the RSPCA gave specific advice on the question of animal abuse and Dr. Roy Rickman, pioneer in tropical medicine, on equipment that can be of use for forensic work in the field.

We are grateful to the librarians and staff of the Hugh Wooding Law School, the Faculty of Medical Sciences (Mount Hope) and the University of the West Indies, all in Trinidad, for their assistance and for permitting us to use their facilities. Particular thanks are owed to Sheree Singh, Ray Ganessingh, Jason Oliver, Brian Castillo and Christian Kalloo for their patience and help on many occasions. As always, we acknowledge the libraries of the Royal College of Veterinary Surgeons, the Department of Veterinary Medicine, University of Cambridge and the Royal Entomological Society, for help with references and their continuing support.

The Case Studies in Appendix D were kindly provided by J. D. Watkins, MRCVS; R. Suepaul, DVM; M. Sugumaran, BVSc; S. Chawla, BVSc & AH and J. F. Reece, BSc, BVSc, MRCVS; and R. Norman, PhD, MACVS, MRCVS.

Many of the photographs in the book were taken by Margaret Cooper. A number, designated as such, were the work of Richard Spence, our friend, the Medical Photographer at the Faculty of Medical Sciences of the University of the West Indies (UWI). In reproducing portraits of the late Dr Edward Elkan and Major Maxwell Knight, we pay tribute to their families, not only for giving us the pictures but also for their encouragement and hospitality in years gone by. Other kind friends have helped with the artwork. Alësha Naranjit, BSc, leading light in the UWI Biological Society, prepared the line drawings that appear at the end of each chapter. Our friend, colleague and fellow ‘Brit’ in Trinidad, John Watkins, MRCVS, designed two of the cartoons, provided a contribution to the Appendices and has also given us support in numerous other ways.

We have been given permission to use cartoons by Mahase Calpu and Steve Long that appeared in the Trinidad Daily Express and in Veterinary Times respectively; we acknowledge this with thanks. We owe a special thanks to Janet Slee and the late David Austin for permission to include in our book four of David’s cartoons, which originally appeared in In Practice. We intend that their reproduction here should serve as a memorial to David Austin and a tribute to the pleasure that he has given to his veterinary readers over the years.

Avril Patterson-Pierre (University of the West Indies) regularly printed manuscripts and gave cheery assistance in numerous other ways. As with so many books in the past, our family friend, Sally Dowsett, provided much-appreciated ideas and spontaneous help. Ashley Fegan-Earl supplied valuable advice in the early stages of production.

The typing of the manuscript was largely carried out by Deborah Daniel who coped admirably, with
humour and enthusiasm, with the vagaries of producing a publication such as this – and, in particular, the idiosyncratic way in which the Coopers usually work. Thank you very much!

The completion of a book is never easy or painless, as Churchill’s words at the beginning of our text portray so vividly. It was a pleasure, therefore, to have as our copy-editor Judith Glushanok who worked in partnership with us and on more than one occasion raised our flagging spirits. We are most grateful to her.

One of the most pleasant aspects about working in Trinidad for the University of the West Indies has been to have for our home a colonial-style bungalow with a garden that is full of animal and plant life. Here we have been able to retreat to compile this book, in the company of hummingbirds, iguanas and red anartia butterflies. These reminders of the fragile beauty of our planet, coupled with the kindness of local friends, have made our task far more pleasurable than ever expected. We are grateful.

John and Margaret Cooper
St. Augustine
14th February, 2006
## Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>AVMA</td>
<td>American Veterinary Medical Association</td>
</tr>
<tr>
<td>CAWC</td>
<td>Companion Animal Welfare Council</td>
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<tr>
<td>CAWT</td>
<td>Coalition Against Wildlife Trafficking</td>
</tr>
<tr>
<td>CITES</td>
<td>Convention on International Trade in Endangered Species of Wild Fauna and Flora</td>
</tr>
<tr>
<td>CIWF</td>
<td>Compassion in World Farming</td>
</tr>
<tr>
<td>COTES</td>
<td>Control of Trade in Endangered Species</td>
</tr>
<tr>
<td>CPD</td>
<td>continuing professional development</td>
</tr>
<tr>
<td>CRFP</td>
<td>Council for the Registration of Forensic Practitioners</td>
</tr>
<tr>
<td>DEFRA</td>
<td>Department for Environment, Food and Rural Affairs</td>
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<tr>
<td>EBVM</td>
<td>evidence-based veterinary medicine</td>
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<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>FAWC</td>
<td>Farm Animal Welfare Council</td>
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<tr>
<td>GI</td>
<td>gastro-intestinal</td>
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<tr>
<td>GPC</td>
<td>Guide to Professional Conduct (of the RCVS)</td>
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<tr>
<td>HSA</td>
<td>Humane Slaughter Association</td>
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<tr>
<td>ICZN</td>
<td>International Commission on Zoological Nomenclature</td>
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<tr>
<td>IMLU</td>
<td>Independent Medico Legal Units</td>
</tr>
<tr>
<td>IUCN</td>
<td>World Conservation Union</td>
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<tr>
<td>MRCVS</td>
<td>Member of the Royal College of Veterinary Surgeons</td>
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<tr>
<td>NAI</td>
<td>non-accidental injury</td>
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<tr>
<td>OIE</td>
<td>Office International des Epizooties</td>
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<tr>
<td>PAW</td>
<td>Partnership for Action against Wildlife Crime</td>
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<tr>
<td>PMI</td>
<td><em>post-mortem</em> interval</td>
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<tr>
<td>RCVS</td>
<td>Royal College of Veterinary Surgeons</td>
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<tr>
<td>RSPB</td>
<td>Royal Society for the Protection of Birds</td>
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<tr>
<td>RSPCA</td>
<td>Royal Society for the Prevention of Cruelty to Animals</td>
</tr>
<tr>
<td>SEM</td>
<td>scanning electron-micrograph/micrography</td>
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<tr>
<td>SSC</td>
<td>Species Survival Commission</td>
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<tr>
<td>UFAW</td>
<td>Universities Federation for Animal Welfare</td>
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<tr>
<td>UK</td>
<td>United Kingdom</td>
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<tr>
<td>UN</td>
<td>United Nations</td>
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<tr>
<td>USA</td>
<td>United States of America</td>
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<tr>
<td>USFWS</td>
<td>United States Fish and Wildlife Service</td>
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<tr>
<td>WCA</td>
<td>Wildlife and Countryside Act</td>
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<tr>
<td>WHO</td>
<td>World Health Organization</td>
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<tr>
<td>WSAVA</td>
<td>World Small Animal Veterinary Association</td>
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<td>WSPA</td>
<td>World Society for the Protection of Animals</td>
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Introduction

Chapter 1  What is Forensic Medicine?
Chapter 2  Special Features of Veterinary and Comparative Forensic Medicine
Chapter 3  Importance and Application of Animal Law


**CHAPTER 1**

**What is Forensic Medicine?**

*Homo homini lupus. (Man is a wolf to man.)*

**INTRODUCTION**

To many members of the public the term ‘forensic medicine’ conjures up images of dead bodies, gruesome accidents and painstaking investigation by medical and other scientists, often in unpleasant or macabre circumstances. However, the word forensic, as defined in the Concise Oxford Dictionary, means ‘relating to, used in, or connected with a court of law’. The dictionary then defines ‘forensic medicine’ as ‘the applied use of medical knowledge, especially pathology, to the purpose of the law.’ Therefore, it encompasses much more than the narrow field of work described above.

The origin of the word forensic is significant. It is derived from the Latin word *forensis* which meant ‘public’. This in turn was derived from *forum*, originally a market, later a place of debate – a reminder that forensic work is subject to open discussion and scrutiny, usually in the public arena of court or other legal or quasi-legal proceedings and rarely carried out behind closed doors.

During the last 30 years or so the concept and understanding of the term ‘forensic’ has broadened, particularly in respect of the following:

- An increasing tendency to encompass within the term ‘forensic’ various non-legal aspects – as discussed in Chapter 2.

Quite apart from the above, the methods used in conventional forensic work are also largely applicable to situations outside the courts, such as insurance claims, appearances at tribunals, inquiries, environmental impact assessments, Public Service Commissions and the like (see Chapter 2) – or when defending or propounding allegations of professional misconduct or other disciplinary measures.

**HISTORY**

Human forensic medicine has a long and interesting, but not always distinguished, history. Some of the earliest records of its use came from China (see Chapter 7 and Smith, 1986). Islamic medicine often applied a forensic approach to the investigation of disease and the causes of death (see, for example, Tibi, 2006). The origins and evolution of forensic medicine in Europe were explored and described by Davis (1974) who reminded readers that continental Europe essentially took the lead in medicolegal investigations in the last millennium. Forensic necropsies were performed in Italy and Germany 500 years before they formed part of coroners’ inquests in England and Wales. Medical evidence from physicians and surgeons was
admitted at trials in England in the 17th and 18th centuries (Ranson, 1996) but it was not until the late 1800s that the many deficiencies in the British system began to be rectified (Forbes, 1981; Lane, 1990) – and then largely as a result of the work of the famous Hunter brothers (Cornelius, 1978).

William Hunter (1783) wrote a seminal essay on the signs of murder in ‘bastard’ children and his brother John produced lecture notes and essays describing improved methods for dissection and for the diagnosis of disease (Hunter, undated). In March 1781 John Hunter had a humiliating experience in the trial for murder of Captain John Donellan where his cautious views as the medical witness for the defence were ridiculed and essentially over-ridden by the judge, Mr. Justice Buller, and, instead, ‘more emphatic, dogmatic and unscientifically-based evidence of the other doctors’ (Davis, 1974) held sway. As a result, Donellan was executed. Hunter was badly shaken by this ordeal and told his students: ‘A poor devil was lately hanged at Warwick upon no other testimony than that of physical men [physicians] whose first experiments were made on this occasion’ (quoted by Moore, 2005). The ‘experiments’ referred to were poorly performed toxicological studies carried out on dogs by the doctors called by the prosecution, but Hunter was equally disdainful of the inadequate autopsy that they had performed. The hearings and their aftermaths have been re-examined and analysed by a number of authors, including Grove (1943).

The Donellan case prompted much open debate by the press and public (Blanchard, 1781), and concern amongst the medical profession prompted an upsurge of interest in Britain in the practice of forensics. Farr (1788) produced an enlarged, translated version of Fazelius’ *Elementa Medicinae Forensis* and other, rather inadequate, volumes followed. It was left to George Edward Male (1779–1845) to write the first sound text on the subject – *Epitome of Juridical or Forensic Medicine for the Use of Medical Men, Coroners and Barristers* (Male, 1816).

On account of his writings and work, Male is usually considered to be the father of medical jurisprudence in Britain. His publications in 1816 and 1818 set the scene for the development of a more scientific approach towards forensic medicine. It is of interest and significance that Male stated in the preface to his first book, ‘... the indignation which has been excited by the perusal of the medical evidence adduced in some recent trials, has induced me to offer [these papers] to the public.’

The most influential medical forensic man in developing the field in the more recent past was undoubtedly Sir Bernard Spilsbury (1877–1947) who first came to public attention during the trial of Dr. H. H. Crippen and soon became a household name in Britain. Spilsbury was involved in most of the highly publicised murder cases in the UK. In Spilsbury’s time the medical forensic expert was generally the key person in forensic investigations. He (and it was usually a man!) would not only have been able to speak and to give an opinion with great authority on medical matters but also would have been the link, the conduit, to people from other disciplines, such as chemists who could analyse poisons, fingerprint experts, botanists and soil scientists.

The long-standing role and status of the medical profession in forensic work in the English-speaking world were aptly summarised and lauded by John Harber Phillips, Chief Justice of Victoria, Australia, who wrote, ‘These pictures from the past capture, more vividly than any dissertation, the service that medicine has for so long given to the law. A service given fully and freely, with precision of expression and meticulous attention to detail.’ (Phillips, 1996).

It is not surprising that the medical profession has been so often associated with crime investigation. The physician needs powers of observation and the ability to assemble the clinical findings with history and background information to construct a whole picture of the patient. It is also small wonder that the fictitious detective Sherlock Holmes was the creation of an eminent medical man, Sir Arthur Conan Doyle, who was strongly influenced by one of his teachers at Edinburgh University (Peschel and Peschel, 1989). Interestingly, the only real-life case in which Conan Doyle was himself involved related to the mutilation of livestock. The man found guilty of this crime was George Edalji, a solicitor, the Anglo-Indian son of a Staffordshire vicar. He served a seven-year prison term, but
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Conan Doyle spearheaded the investigations and campaign that led to Edalji’s being pardoned. The story has been dramatised in a recent book (Barnes, 2005), worth reading to gain insight into the life and thinking of the man who created the world’s most famous detective.

Many medical texts have encouraged their readers, especially students, to adopt a detective’s approach to clinical and pathological investigation. The delightful little book *Exotica* (Symmers, 1984) presented some of the author’s more unusual cases and described how they were investigated and often solved using ingenuity and lateral thinking.

THE RISE OF FORENSIC SCIENCE

However, the situation has changed considerably over recent decades. No longer is the medical man or woman central to legal investigations: instead, s/he is one of a team. Forensic science has emerged and matured and the medically-trained expert is now just one part of that discipline, as depicted in Figure 1.1.

We speak now of ‘forensic scientists’ who, in turn, describe themselves as ‘forensic chemists’, ‘forensic botanists’ or ‘forensic biologists’, and so on. An important, albeit poorly proof-read, introduction to the scope and role of contemporary forensic science is provided in the book edited by P. C. White (2004), published by the Royal Society of Chemistry.

TEACHING AND ACCREDITATION OF FORENSIC SCIENCE

The growth of forensic science has created a need to educate and teach and to ensure that the training offered is of a satisfactory standard and objectively assessed and accredited by an independent body.

In the UK, many universities and colleges have started undergraduate and other programmes covering a range of forensic disciplines and the Forensic Science Society (see Appendix B) has commenced an accreditation service for such courses. Those eligible for accreditation have normally a Bachelor’s degree with Honours or a post-graduate qualification such as a taught Master’s degree. The scheme was developed to help establish and maintain standards of education in forensic science and it involves major employers and professional interests. Similar accreditation schemes are evolving in some other countries.

The accreditation of those who present forensic evidence is proving more contentious (see Chapter 13). The role in this regard of the UK’s Council for the Registration of Forensic Practitioners (CRFP) (see Appendix B) is discussed elsewhere in the book.

![Figure 1.1](image.png) The position and role of forensic medicine.
Chapter 1

THE CHANGING FORTUNES OF FORENSIC MEDICINE

While forensic science has gained ground, the role and status of human forensic medicine have been challenged. In the UK questions have been asked about the role and competence of ‘police surgeons’ (forensic physicians), once the backbone of the service, and their ability, as medical practitioners with limited training in forensic matters, to cope with present demands. Forensic pathology has suffered considerably from closure of units and departments, the dismantling of museums (partly a result of concerns over the retention of human tissues – see below and Chapter 7) and a move from official (government/coroner/police) funding towards the use of private pathology services. The recruitment of trainee forensic pathologists has also waned. This is paradoxical because in many countries there is great public interest in forensic pathology, fomented by television and other media (Westwell, 2005) and the increasing demands of society that when a death or accident occurs, there should be no curbs in determining the circumstances and ascertaining where blame or culpability might lie.

At the time of writing (July 2005), the medical profession, including some of those involved in forensic and allied studies, is under attack, especially in the UK. Scandals relating to the retention of human tissues have cast medical pathologists in a bad light and have led to the passage of the Human Tissue Act 2004 which imposes strict conditions on those working with derivatives of live or dead Homo sapiens (see Chapter 6). Individual pathologists have also sometimes fuelled public anxiety – for instance, at the inquest in a high-profile murder case in Kenya, where a forensic pathologist admitted, ‘I lied over murder on safari trip.’ (Horsnell, 2004).

Confidence in medical witnesses has also been eroded by miscarriages of justice when innocent people, whose children had died under unusual circumstances, were imprisoned following ‘misleading and flawed’ evidence by a leading experienced paediatrician (General Medical Council Hearing, June 2005), who was subsequently removed from (later restored to) the British Medical Register (see Chapter 12). How this situation might have arisen has been discussed and analysed (Le Fanu, 2005; Hall, 2006), but the damage had been done and the populace was outraged.

Public concern about the efficiency and reliability of the General Medical Council had earlier been shaken in the UK by the arrest and conviction of a supposedly trusted and reliable family physician, Harold Shipman, who probably killed hundreds of patients and had long escaped detection (www.the-shipman-inquiry.org.uk/home.asp). As Michell (2005) pointed out, the repercussions are likely to be considerable and could finish the tradition of self-regulation by the medical (and possibly other?) professions.

This situation has probably not been helped by the actions of many ‘western’ governments, to deregulate the professions, in the interests of competition, and thereby reduce their influence in society (Watkins et al., 1996; Michell, 2002). Self-regulation has been criticised on the grounds that the professional body serves as both judge and jury and this has prompted the inclusion of more ‘lay members’ on some disciplinary and ethical committees. Even the term ‘profession’ has been devalued and is increasingly used by groups of people who are not subject to the constraints of a body which has disciplinary powers.

NEW FIELDS

There are, however, other factors and various public concerns that are helping to mould a new approach
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to forensic medicine. These relate particularly to the protection of human rights and to the provision of relief in, and investigation of, disasters. There is some overlap between these two.

Insofar as human rights are concerned, there is increasing disquiet in some countries and groupings, galvanised by the United Nations (UN) and organisations such as Amnesty International (see Appendix B), about the continuing abuse of individuals and communities in many parts of the world (Cox, 2003). Often this has been accompanied by an increase in the use of harsh punishments, aggressive interrogation and detention without trial – sometimes justified on the grounds of ‘protecting national security’. The medical profession is playing a leading role in the investigation of such claims – for example, by the clinical examination of those who claim to be victims of torture or who seek asylum because of alleged oppression (Heisler et al., 2003; Shepherd, 2003). An extension of this is collaboration by doctors and lawyers to provide professional help to those finding themselves in such a position – for example, the Independent Medico Legal Units (IMLU) established in South Africa and Kenya (Olumbe et al., undated).

Disasters can be conveniently divided into those that are:

- Natural, physical – hurricanes, volcanoes, earthquakes, tsunamis.
- Natural, infectious – outbreaks of Ebola, Marburg, avian influenza.
- Anthropogenic (human-induced) – transportation (e.g. aircraft crashes), war, civil unrest, genocide (Blau and Skinner, 2005), torture, terrorism (including the use of biological and chemical agents) (Durrant, 2002).

They can also be categorised according to their scope (international, national or local), rate of onset (sudden or slow) and source (Sprayson, 2006).
Enhanced public and inter-governmental concern over disasters has led to a demand for a greater number of appropriately trained and experienced people, to include forensic physicians, pathologists, psychiatrists and paediatricians, often together with anthropologists (Klepinger, 2006), who can respond, investigate and report back to the international community. The medical profession plays an influential part in such disaster relief and reconstruction. Its expanding contribution is reflected by the appearance of many relevant publications and by the launching of a new interdisciplinary Faculty of Conflict and Catastrophe by the Society of Apothecaries of London (see Appendix B), for example.

It is clear that despite changes in the responsibilities and fortunes of human medical forensic experts recently, they still have an indispensable part to play. Fields of forensic science in which the medical profession continues to be active, often taking the lead role, are described in many texts – see, for example, DiMaio and DiMaio (2001); Siegel et al. (2000); and Shepherd (2003). The main categories are listed below.

Clinical and/or post-mortem examination of human victims

- Physical injuries (wounds) including those caused by firearms and explosives, traffic, railway and aircraft injuries.
- Asphyxia.
- Immersion and drowning.
- Heat, cold, electricity.
- Sexual offences.
- Abortion.
- Infant neglect, elder abuse, starvation.
- Torture, armed conflict.
- Disasters – natural and anthropogenic.
- Poisoning.
- Alcoholism.
- Drugs of dependence and abuse.
- Over-dosage of medical drugs.

Post-mortem examination of human victims

As above, plus:

- Unexpected and sudden death.
- Exhumation.
- Identification and aging/dating of human remains.
INTERDISCIPLINARY LINKS

There are close links between contemporary forensic medicine and various other disciplines. Some of these, in just one area, pathology, are depicted in Figure 1.7.

These and other spheres of shared interest mean that those working in forensic medicine in future will need to collaborate more and to share experiences and skills. Such co-operation is likely to grow as other fields mature, including veterinary and comparative forensics, the subject of this book, and ‘environmental forensics’ (Morrison, 1999; Murphy and Morrison, 2002), which relates to human health and that of animals, plants and ecosystems (see Chapters 2 and 13).

A very broad spectrum of experts already work closely with medical forensic personnel. They include anthropologists, DNA specialists, drug analysts, entomologists, ballistics experts, fingerprint specialists, fire-scene examiners, collision investigators, document examiners, footwear analysts, fingerprint experts, vehicle examiners, archaeologists, computer specialists, toxicologists and blood-pattern analysts. The roles of some of these are described further elsewhere.

THE REQUIREMENTS

Forensic medical work differs in many ways from routine diagnosis and treatment. As pointed out earlier, the origin of the term ‘forensic’ provides a constant reminder that forensic work is subject to open debate. The person providing evidence (even if an ‘expert’) may well be exposed to interrogation, criticism and attempts to discredit (see Chapter 12). Therefore, forensic medicine needs a special approach and not all general practitioners, physicians, surgeons, paediatricians and pathologists may be comfortable with this. The transparent nature of modern forensic science, especially if court appearances are required, means that members of the medical or allied professions likely to participate must be fully prepared, both professionally and psychologically. Even those who do their utmost to steer clear of legal issues may have no choice but to be involved in what is perceived generally to be a very specialised area.
In the foregoing chapter, the essence of forensic medicine as it has traditionally related to medico-legal work with humans was discussed. In this chapter the particular features of veterinary and what we define as ‘comparative’ forensic medicine are described. Essentially the two relate to animal forensics – that is, matters of a legal or similar serious nature in which animals play a substantial part.

First, it is important to remember that animals can be involved in legal actions in two distinct ways: they can be either the victim (i.e. the object) of an assault or illegal act, or the instigator (i.e. the subject) where the animal causes the incident. This second area, when animals bring about the incident, is, arguably, an area of forensic veterinary medicine as well as forensic human medicine, because any ensuing legal case will probably require expert evidence from a veterinarian and/or others with specialised knowledge. The basic principles of forensic investigation, in relation to meticulous record-keeping, systematic examination and proper treatment of material are the same, regardless of whether the victim is human or not.

**THE ANIMAL AS THE VICTIM (THE OBJECT)**

Injuries and insults may be inflicted on animals maliciously or accidentally and can embrace a variety of attacks, perversions and mutilations. Examples are given in Table 2.1 (see also Chapters 6 and 7). Arkow and Munro (2006) provide a useful categorisation of assaults on companion animals.

There has been extensive study of some forms of ‘human-induced’ damage to animals – for example, non-accidental injury caused to dogs and cats (see Chapter 6), the effects of traps, snares and shooting on wildlife (see Chapter 5) and the various factors that can cause injury or death in marine mammals (Read and Murray, 2000).

Death, injury, ill health, pain or distress may result from most of the examples above but the implications usually differ, depending on species and circumstances. There are often parallels with human forensic work: the ‘battered pet’ syndrome described some years ago (Munro, 1996) led to recognition of links between animal abuse and violence to humans and development of a new discipline (see Chapter 6).

**THE ANIMAL AS THE CAUSE (THE SUBJECT)**

Injuries provoked by animals include bites from wild and domestic species, trauma, electrocution, stings and hypersensitivity reactions (Strickland, 1991). Animals can infect humans with sundry pathogenic organisms leading to various zoonotic diseases (see later).
Table 2.1 Injuries and other insults that may be inflicted on animals by humans.

<table>
<thead>
<tr>
<th>Insult</th>
<th>Features</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical</td>
<td>Injuries due to trauma, heat, cold, immersion in water, etc.</td>
<td>Often unintentional but can include ‘non-accidental injury’ (NAI)</td>
</tr>
<tr>
<td>Sexual</td>
<td>Attempted copulation</td>
<td>May be part of sexual abuse or normal veterinary/husbandry practices</td>
</tr>
<tr>
<td></td>
<td>Surgical or malicious damage or manipulation to genital organs, castration, ovariecotmy, vasectomy, etc.</td>
<td></td>
</tr>
<tr>
<td>Psychological</td>
<td>Deprivation of company or unsuitable social grouping</td>
<td>Sometimes part of normal veterinary or husbandry procedures</td>
</tr>
<tr>
<td></td>
<td>Taunting, teasing or threatening</td>
<td>Can be part of animal abuse</td>
</tr>
</tbody>
</table>

Table 2.2 gives some examples of bites, stings and other non-infectious insults that may be inflicted by animals on humans or other species.

The clinical and post-mortem appearances in such cases may be similar or very different: initial lesions are likely to change, if the affected individual survives, because of inflammatory/allergic reactions, contusion, infection or self-inflicted injury.

**FORENSIC SIGNIFICANCE OF ANIMAL BITES AND STINGS**

Animal bites and stings can be of forensic (legal, insurance, malpractice) significance for various reasons, particularly if they cause:

- Physical damage to humans, other animals or property.
- Toxic damage to humans and other animals.
- Psychological damage to humans, possibly to other animals.
- Infection, with or without clinical disease, in humans and other animals.

Bites and stings from animals can be inflicted inadvertently: a dog may bite a person’s hand when the animal is offered an item of food; a farmer can be ‘bitten’ while restraining a calf because his fingers are in its mouth; an otherwise inoffensive snake may strike at an owner because it is shedding its skin and therefore has impaired vision (Cooper, 1967). Alternatively, bites may be deliberate: the animal bites because it is aggressive or is frightened or feels...

![Figure 2.1](image1)

Figure 2.1 An emperor scorpion. Not a very venomous species but liable to elicit fear and psychological effects.

![Figure 2.2](image2)

Figure 2.2 Sea urchin wounds, ringed with a marking pen, in the foot of a tourist, several weeks after the incident.
### Table 2.2 Bites, stings and other non-infectious insults from animals.

<table>
<thead>
<tr>
<th>Insult</th>
<th>Features</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bite</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>From a mammal</td>
<td>Bruising, skin wounds, tooth marks Other lesions may be present if the animal has also scratched (e.g. cat) or kicked/trampled (e.g. horse) Goring by bulls and other ungulates can cause severe internal damage, sometimes death</td>
<td>Appearance of wound depends upon circumstances and species of animal (e.g. a carnivore’s teeth tend to tear whereas the flat cheek teeth of a ruminant will grind and crush tissue) (see Chapters 6 and 7)</td>
</tr>
<tr>
<td>From a bat</td>
<td>Tooth marks, persistent bleeding if a vampire (<em>Desmodus</em> sp.) involved</td>
<td>Bats may transmit infections including rabies, other viruses and trypanosomiasis</td>
</tr>
<tr>
<td>From a bird</td>
<td>As for bat but no tooth marks Some species (e.g. parrots) bite, others (e.g. storks) stab, others (e.g. falcons) strike with talons, ratites (e.g. ostriches) kick</td>
<td>Wound appearance very variable Various micro-organisms can be transmitted by bites and scratches</td>
</tr>
<tr>
<td>From a snake:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Venomous (e.g. cobra, rattlesnake, fer-de-lance)</td>
<td>Fang marks and lesions depend on snake and type of venom</td>
<td>The bites of all snakes, even those that are non-venomous, can introduce pathogenic organisms, especially bacteria</td>
</tr>
<tr>
<td>• Non-venomous (e.g. python)</td>
<td>Tooth marks (not fangs – rows) with local haemorrhage and swelling</td>
<td>See above In exceptional cases ocular damage can ensue (Cooper, 1967) Traumatic asphyxia has been reported following constriction (DiMaio and DiMaio, 2001)</td>
</tr>
<tr>
<td>From a lizard (only two significant species of venomous lizard, both <em>Heloderma</em> spp.)</td>
<td>Bite marks and local, sometimes systemic, signs</td>
<td>The bites of non-venomous carnivorous lizards can introduce bacteria The saliva of some other ‘harmless’ lizards may contain toxic chemicals</td>
</tr>
<tr>
<td>From a crocodile</td>
<td>Tearing wounds, sometimes dislocation of limbs May cause drowning</td>
<td>Much anecdotal and some scientific documentation (see Fergusson, 2004)</td>
</tr>
<tr>
<td>From a fish (e.g. shark)</td>
<td>Ragged bite and tear wounds (especially limbs); can be fatal Drowning possible Death may be due to hypovolaemic shock</td>
<td>Sometimes occur in freshwater, in shallow or coastal reef areas (Williams <em>et al.</em>, 1998) but usually in deep sea. Much variation in shark behaviour Other species of fish, e.g. moray eels and barracuda, may also cause damage</td>
</tr>
<tr>
<td>From a spider (Arachnida: many species). The black widow <em>Latrodectus</em> sp. is probably most notorious)</td>
<td>Erythema and oedema of the skin, often associated with puncture marks</td>
<td>Although most species of spider can bite, few are able to penetrate human or animal skin and only a handful are sufficiently toxic to cause envenomation (Continued)</td>
</tr>
</tbody>
</table>